TORONTO Water

HUMBER TREATMENT PLANT

2018 Annual Report

March 28, 2019

EXECUTIVE SUMMARY

The Humber Treatment Plant (HTP) is one of four wastewater treatment facilities operated by the City of Toronto. This facility, located at 130 The Queensway, has a rated capacity of 473,000 m^3/day or 473 ML/day, and serves an equivalent population of approximately 685,000. Humber Treatment Plant discharges into Lake Ontario and operates under Amended Environmental Compliance Approval No. 9032-ABZNYQ, issued on July 21, 2016.

The average daily flow rate in 2018 was 286.1 ML/day. Influent concentrations of Biochemical Oxygen Demand (BOD), Total Phosphorus (TP) and Total Suspended Solids (TSS) averaged 247.8 mg/L, 5.2 mg/L and 280.8 mg/L, respectively.

Humber Treatment Plant achieved the following effluent quality and loading rates in 2018 in comparison to ECA limits:

	ECA[1]	2018 Final Effluent
Total Suspended Solids (TSS)	25.0 mg/L	11.0 mg/L
Carbonaceous Biochemical Oxygen Demand ($CBOD_5$)	25.0 mg/L	5.9 mg/L
Total Phosphorus (TP)	1.0 mg/L	0.6 mg/L
Escherichia Coli (E. Coli)[2]	200 CFU/100mL	68 CFU/100 mL
pH	6.0-9.5	7.0
Total Residual Chlorine (TRC) (i.e. Dechlorination)	0.02 mg/L	0.010 mg/L
TP Loading Rate	473.0 kg/day	177.8 kg/day

[1] Referenced from Condition 6 and 7 of ECA No. 9032-ABZNYQ, issued on July 21, 2016.

[2] Arithmetic mean of monthly geometric mean data.

Sludge generated at the Humber Treatment Plant is transferred to the Ashbridges Bay Treatment Plant via the Mid-Toronto Interceptor (MTI) for further treatment and disposal. During 2018, an average of 4,208 m^3/day of waste activated sludge was removed from the system. Of this, 3697 m^3/day was thickened and stabilized prior to transfer and 511 m^3/day was transferred directly. An average of 78 dry tonnes of biosolids and waste activated sludge was transferred per day.

Ferrous chloride consumption for phosphorus removal was 6.84 tonnes as iron (Fe) per 1000ML wastewater treated. There was no polymer consumption for waste activated sludge (WAS) thickening. Total sodium hypochlorite (12% w/v) consumption for disinfection totalled 42.54 per 1000 ML. Sodium Bisulphite (SBS) (38% w/w) consumption for effluent dechlorination totalled 5.55 m^3 per 1000 ML.

There were 17 bypass occurrences in 2018 where each occurrence received preliminary, primary treatment, nutrient removal, as well as disinfection before being blended with fully treated plant effluent and exiting the plant through the plant outfall, upstream of the final effluent sampling point.

The plant continued with various capital projects. Notable projects included: PLC Migration, Secondary Treatment Upgrades, West Substation Upgrades, Operations Centre Upgrades, Cogeneration Facility, Odour Control Phase 1 Implementation, Digester 9 and 10 Cleaning and Upgrades, HVAC Upgrades, Premise Isolation Installation, Primary Pumping and Scum Systems Upgrades, and Waste Gas Burner Upgrades. A variety of scheduled, preventative, predictive and reactive maintenance activities was performed, including annual calibration of effluent monitoring equipment.

Total annual consumption of potable water, hydro, and natural gas was 401,173 m^3, 48.7M kWh, and 2.8M scm, respectively. Plant direct operating cost for 2018 totalled $19.0M. In 2018, the Humber Treatment Plant had a staffing compliment of 60.5 employees. As of December 31st, 2018, there were four health and safety incidents and a total of five lost time days in 2018 due to work related injuries.

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GLOSSARY OF ABREVIATIONS AND DEFINITIONS

AAC	Annual Average Concentration
BOD5	Five-Day Biochemical Oxygen Demand
CBOD5	Five-Day Carbonaceous Biochemical Oxygen Demand
CEU	Continuing Education Units
CFU	Colony Forming Units
DAF	Dissolved Air Flotation
E. Coli	Escherichia Coli
ECA	Environmental Compliance Approval
Fe	Iron
HTP	Humber Treatment Plant
HP	Horsepower
HRT	Hydraulic Retention Time
kg	kilogram
kWh	Kilowatt-hour
MAC	Monthly Average Concentration
MGMD	Monthly Geometric Mean Concentration
MWh	Megawatt-hour
m3	Cubic metre
m3 /day	Cubic metre per day
mA	Milliamps
mg/L	Milligrams per litre
mL	Millilitre
ML	Megalitre (million litres)
MECP	Ministry of the Environment, Conservation and Parks
Q	Flow Rate
RAS	Return Activated Sludge
SBS	Sodium Bisulphite
SBS (P)	Sodium Bisulphite Presence
scm	Standard Cubic Metres
SS	Suspended Solids
TRC	Total Residual Chlorine
TP	Total Phosphorus
TRS	Total Residual Sulphate
TS	Total Solids
TSS	Total Suspended Solids
TVS	Total Volatile Solids
TWAS	Thickened Waste Activated Sludge
µg/L	Micrograms per litre
WAS	Waste Activated Sludge

Definitions

Bypass: A bypass is defined as a diversion of sewage around one or more unit processes within the plant with the diverted sewage flows being returned to the plant treatment train upstream of the final effluent sampling location, and discharging to the environment through the plant outfall.

Overflow: An overflow is defined as a discharge to the environment from the plant at a location other than the plant outfall downstream of the final effluent sampling station.

Spill: A spill is defined within the meaning of Part X of the Environmental Protection Act. "Spill", when used in reference to a pollutant, means a discharge,

a) into the natural environment,
b) from or out of a structure, vehicle or other container, and
c) that is abnormal in quality or quantity in light of the discharge.

Abnormal Discharge: A discharge of a pollutant designated by the regulations at a location designated by the regulations shall be deemed to be in a quantity or with a quality abnormal at the location. R.S.O. 1990, c. E.19, s. 91 (2).

$$Loading\ \left(\frac{kg}{day}\right) = Concentration\ \left(\frac{mg}{L}\right) \times Flow\ \left(\frac{ML}{day}\right)$$

$$Percent\ Removal\ (\%) = 1 - \frac{Concentration\ (Final)}{Concentration\ (Initial)}$$

$$Aeration\ Loading = \left(\frac{kg\ cBOD}{m^3\ aeration\ capacity}\right) = \frac{(Q_{Primary\ Effluent} + Q_{RAS}) \times [cBOD_{5_{primary\ effluent}}]}{V_{aeration\ Tanks}}$$

$$Solids\ Capture\ (\%) = \frac{Centrifuge\ Feed\ TS - Centrate\ TSS}{Centrifuge\ Feed\ TS} \times 100$$

1 INTRODUCTION

The Humber Treatment Plant is one of four wastewater treatment facilities operated by the City of Toronto under the responsibility of the Wastewater Treatment section of Toronto Water. The facility is located at 130 The Queensway, on the border of the old City of Toronto and former City of Etobicoke near the mouth of the Humber River. This area contains an estimated connected population of 685,000. The Humber Treatment Plant has a rated capacity of 473,000 m^3 per day or 473 ML/day.

Major treatment processes and equipment include screening and grit removal, primary treatment, secondary treatment, phosphorus removal with ferrous chloride, final effluent disinfection using sodium hypochlorite, and final effluent dechlorination using sodium bisulphite. Solids handling processes include stabilization by anaerobic digestion. The solids stabilized in these processes are primary (or raw) sludge as well as waste activated sludge thickened using high speed centrifuges. Treated effluent is discharged to Lake Ontario. Sludge (stabilized and non-thickened waste activated sludge) is transferred to the Ashbridges Bay Treatment Plant for disposal via the Mid-Toronto Interceptor (MTI). Numerous auxiliary systems are required for the proper operation of plant processes and include potable water, process water, HVAC, SCADA, electrical power distribution, natural gas, and, instrument air. Odour control is achieved by treating air through biofilters and granular activated carbon (GAC) filters located throughout the plant.

The Ministry of the Environment, Conservation and Parks (MECP) has classified the Humber Treatment Plant as a Class IV wastewater treatment facility under Regulation 129/04. The facility operates under Amended Environmental Compliance Approval No. 9032-ABZNYQ (July 21, 2016).

This report is a summary of plant operations and performance in 2018. Highlights of the report include a discussion of effluent quality and summaries of plant operations and maintenance, chemical and utility consumption, capital projects, operational costs and human resources.

2 PLANT PROCESS OVERVIEW

A description of the plant process is included below. A Plant process flow diagram is available in Appendix A. Additional information on the plant's process can be found on the City of Toronto website[1].

2.1 Influent

Wastewater from the Queensway Sanitary Trunk Sewer and Humber Sanitary Trunk Sewer flows to the plant to a common influent channel. A portion of the Humber Treatment Plant sewershed consists of combined sanitary and storm sewers, causing plant influent to be sensitive to wet weather events.

2.2 Preliminary Treatment

Raw wastewater enters the Headworks for grit and screenings removal. Bar screens with 12 mm openings remove rags and debris. Ferrous chloride is applied to the distribution conduits to the Grit system for the first stage of phosphorous removal. Grit is removed in grit vortex chambers and aerated grit channels. The removed grit and screenings are hauled to a sanitary landfill site.

2.3 Primary Treatment

Primary Treatment occurs in the Primary Clarification Tanks, where the flow velocity of the wastewater is reduced to allow heavier solids to settle to the bottom and lighter solids float to the top. There are 11 Primary Clarification Tanks. Sludge collectors in the tanks sweep the settled sludge, called primary or raw sludge, into sludge hoppers. Floating solids called scum are collected from the top of the water and swept into scum hoppers. The primary sludge and scum is then pumped out for further treatment and the wastewater, called primary effluent, continues onto secondary treatment.

2.4 Secondary Treatment

The primary effluent receives secondary treatment through a conventional, suspended biomass activated sludge process in the Aeration Tanks. The mixed liquor consists of primary effluent mixed with return activated sludge (RAS), which is removed from the Final Clarification Tanks and contains micro-organisms that naturally occur in wastewater and

[1] https://www.toronto.ca/services-payments/water-environment/managing-sewage-in-toronto/wastewater-treatment-plants-and-reports/

facilitate its degradation. In the presence of oxygen, these micro-organisms break down organic material in the wastewater. Air is supplied to the Aeration Tanks through nine electrically driven blowers. There are a total of eight Aeration Tanks each equipped with fine bubble dome diffusers. Ferrous chloride is applied at the end of the aeration tanks prior to the Final Clarification Tanks for the second and final stage of phosphorous removal.

The mixed liquor from the Aeration Tanks flows to 21 large quiescent Final Clarification Tanks, where the Activated Sludge is allowed to settle. A controlled quantity of this sludge is returned to the Aeration Tanks as RAS in order to maintain a sufficient biomass concentration. The excess is removed as Waste Activated Sludge (WAS) and thickened using centrifuges.

2.5 Final Effluent

Sodium Hypochlorite is used to disinfect and kill pathogens in the final effluent. Sodium Bisulphite (SBS) is added after disinfection to remove excess chlorine (dechlorinate) from the wastewater; helping to protect the aquatic environment. The final effluent is discharged to Lake Ontario. The plant uses direct measurement of Total Residual Chlorine (TRC) in the final effluent for monitoring and compliance.

2.6 Solids Handling

Primary sludge and scum, from the Primary Clarification Tanks, is first fed into primary anaerobic digesters. Secondary sludge (WAS), from the Secondary Clarification Tanks, is thickened through centrifugation before it is also fed into primary digesters, where it undergoes the same process as primary sludge. Centrifugation reduces the volume of sludge by separating solids from liquid. The Thickening process consists of seven centrifuges. Unthickened WAS may also be pumped directly to the Ashbridges Bay Treatment Plant via the MTI.

Anaerobic digestion is the biological degradation (stabilization) of organic materials (sludge and scum) in the absence of oxygen – it reduces volume of solids, destroys pathogens and mitigates sludge odour. The process produces digester gas, made up predominantly of methane. This gas is used as a supplementary fuel for plant needs, including process and space heating and the generation of electricity via two cogeneration engines, thereby reducing the plant's operating costs and carbon footprint. The digesters are operated in the mesophilic temperature range (34 – 38^{o}C). The target operating temperature for the digesters is 36^{o}C.

The resulting anaerobically digested sludge (biosolids) is subsequently transferred to the secondary digesters for storage, until it is ultimately transferred to the Ashbridges Bay Treatment Plant via the MTI for further treatment.

3 PROCESS SUMMARY

3.1 Process Parameters

In 2018, the Humber Treatment Plant continued to produce a high quality effluent. A summary of key final effluent parameters against the ECA objectives and limits are shown in Table 1. Regulated parameters are highlighted. Influent and effluent performance charts are available in Appendix B. Historical performance data is included in Appendix C.

Table 1: Final Effluent Parameters

Parameter	$cBOD_5$ (mg/L)	TSS (mg/L)	TP (mg/L)	TRC (mg/L)	E Coli (count/ 100mL)
January	7.0	10.0	0.8	0.008	136
February	6.0	8.0	0.6	0.009	55
March	6.0	10.0	0.6	0.010	68
April	8.3	11.9	0.5	0.013	80
May	5.0	9.0	0.5	0.014	52
June	5.0	10.0	0.6	0.014	24
July	5.0	11.0	0.7	0.010	50
August	5.0	12.4	0.6	0.017	67
September	5.0	18.0	0.7	0.006	92
October	5.0	10.0	0.8	0.011	28
November	6.0	10.0	0.5	0.007	55
December	7.0	12.0	0.6	0.006	106
Annual Average	5.9	11.0	0.6	0.010	68
Loading (kg/d) [1]	1,678	3,157	177.8	N/A	N/A
Removal Efficiency[2] *(%)*	97%	96%	88%	N/A	N/A
ECA Requirements[3, 4, 5]					
Effluent Objective	AAC: 15.0mg/L	AAC: 15.0 mg/L	MAC: 0.9 mg/L	MAC: non-detect	MGMD: 150 CFU/100 mL
Effluent Limit	AAC: 25.0 mg/L	AAC: 25.0mg/L	MAC: 1.0 mg/L	MAC: 0.02 mg/L	MGMD: 200 CFU/100 mL
Average Waste Loading Limit[1]	N/A	N/A	AAL: 473.0 kg/d	N/A	N/A

[1] Loading is calculated based on the flow rates as provided in Table 2.

[2] cBOD = 0.8 * BOD assumed for removal efficiency calculatons

[3] The ECA effluent objective and limit for pH is 6.5 to 8.5 and 6.0 to 9.5 respectively, inclusive, at all times. Effluent pH in 2018 was within the required objective and limit.

[4] Referenced from Amended Environmental Compliance Approval No. 9032-ABZNYQ, issued on July 21, 2016.

[5] AAC refers to Annual Average Concentration, MAC refers to Monthly Average Concentration, MGMD revers to Monthly Geometric Mean Density, and AAL refers to Annual Average Daily Loading.

Influent and Final effluent concentrations of eleven select heavy metals have been included in Appendix D. Any discharge into City sewers must meet the sewer use By-law limits. Final effluent concentrations are presented to assess the treatment plant's removal capacity.

A summary of the annual averages of process parameters over the past three years are shown in Table 2.

Table 2: Process Summary

Parameter	Units	2018	2017	2016
Flow[1]	ML/day	286.1	331.7	257.3
Total Annual Flow[1]	ML	104,417	121,062	94,168
Influent Parameters				
Total Suspended Solids (TSS)	mg/L	280.8	301.2	331.0
Biochemical Oxygen Demand (BOD_5)	mg/L	247.8	255.2	299.0
Total Phosphorus (TP)	mg/L	5.2	5.3	5.8
Preliminary Treatment				
Grit and Screenings	Tonnes/day	4.1	2.1	1.6
Primary Treatment				
TSS	mg/L	95.7	102.0	94.0
cBOD5	mg/L	140.9	118.3	158.0
Secondary Treatment				
Aeration Loading	kg $CBOD_5/m^3$.day	0.44	0.41	0.38
Mixed Liquor Suspended Solids	mg/L	2,839	2,842	2,953
Solids Handling				
Primary Sludge Treated	m^3/day	2,627	2,814	2,689
Primary Sludge TS	%	2.1	1.9	2.0
Primary Sludge TVS	%	76.7	73.6	70.6
WAS to Thickening	m^3/day	3,697	3,776	3,573
WAS SS	mg/L	9,499	8,806	8,630
TWAS TS	%	3.7	4.6	4.0
TWAS TVS	%	74.9	77.6	75.0
TWAS Treated	m^3/day	961	697[2]	598
Digester Gas Volume	m3/day	26,717	26,248	28,093

[1] Flow monitoring is provided by influent flow meters. There are no effluent flow meters due to infrastructure limitations.

[2] A data quality error resulted in the over reporting of TWAS Treated in the 2017 report. The correct value was 697 m^3/day rather than 715 m^3/day.

In 2018, the total annual influent flow decreased by 14% as compared to 2017. Over the past 5 years, sewage flow to Humber Treatment Plant has tended to decrease, with the exception

of 2017, when unusually high flows were experienced. The TP and TKN concentrations of the sewage have remained relatively constant over the last 5 years, while the BOD5 and TSS have decreased slightly.

The water content of the grit removed increased in 2018 due to process changes. This led to a higher volume of grit and screening being removed from the wastewater. The percent solids of the TWAS decreased as a result of centrifuge operations adjustments. This contributed to the increased volume of TWAS treated.

The objective for TRC is given as non-detect. The MECP gives a regulatory method detection limit (RMDL) of 0.01 mg/L for the recommended amperometric method. The Humber treatment plant uses an alternate approved method (colourimetric) for which the MECP does not give a RMDL but which has a lower measurement range, as specified by the manufacturer, of 0.002 mg/L. This allows for more significant figures to be reported. Considering the RMDL of 0.01 mg/L, the Humber Treatment Plant met the objective for TRC in all months except for August. In this month the average TRC was 0.017 mg/L, and still within the parameter's limit.

In 2018, the Humber Treatment Plant encountered no chronic operating problems, and continued to produce a high quality effluent which surpassed requirements of the effluent objectives as described in Condition 6 of the plant's ECA. This was achieved through continuous improvement in operations and maintenance of treatment processes, and infrastructure delivery. The plant also met Federal Government WSER requirements for un-ionized ammonia and acute toxicity.

3.2 Biosolids Management

The flow projections for 2019 do not exceed the plant rated capacity of 473 ML/day and are expected to generate a sludge volume that will be +/- 5% of the volume generated in 2018.

All sludge generated at the Humber Treatment Plant is transferred to the Ashbridges Bay Treatment Plant for further treatment. The sludge generated (WAS and biosolids) during 2018 averaged 4,017 m^3/day (78 dry tonnes per day). A summary of the digested sludge parameter analysis is included in Appendix E.

3.3 Chemical Usage

Several chemicals are used during the treatment process at the plant. Table 3 outlines the chemical consumption for the current and previous year based on 1000ML of water treated in the facility for the past three years. Costs listed are plus applicable taxes.

Table 3: Chemical Usage and Chemical Cost Summary per 1000 ML Treated

Process	Chemical	2018 Usage (/1000ML treated)	2018 Cost ($/1000 ML treated)	2017 Usage (/1000ML treated)	2017 Cost ($/1000 ML treated)	2016 Usage (/1000ML treated)	2016 Cost ($/1000 ML treated)
Phosphorus Removal	Ferrous Chloride as Fe	6.84 tonnes	5,471.96	4.82 tonnes	4,334.40	9.08 tonnes	8,199.24
Disinfection	Sodium Hypochlorite (12% w/v)	42.54 m^3	6,934.02	45.47 m^3	6,006.00	50.17 m^3	6,475.80
Dechlorination	Sodium Bisulphite (32% w/w)	5.55 m^3	1,559.55	5.21 m^3	1,534.00	4.39 m^3	1,289.20
WAS Thickening	Polymer	0.00 tonnes	-	0.00 tonnes	-	0.00 tonnes	-

Ferrous chloride usage increased in 2018 as a response to increasing effluent phosphorus concentrations and to maintain performance in times of reduced clarifier capacity due to secondary treatment process upgrades.

3.4 Bypasses, Overflows, Spills, and Abnormal Discharge Events

3.4.1 Bypasses

There were 17 bypass events in 2018. The total volume of bypass flow was 507 ML, or 0.49% of the annual flow. Bypass flow bypasses secondary treatment (i.e. the Aeration Tanks) but receives preliminary, primary treatment, nutrient removal, as well as disinfection and dechlorination, and exits the plant through the plant outfall before the final effluent sampling point. Secondary bypasses occur due to high wet weather flows that exceed the plant's secondary treatment capacity.. Each instance was reported to the MECP Spills Action Center and recorded into the plant's Monthly report. Secondary bypasses occur due to high wet weather flows that exceed the plant's secondary treatment capacity. Total precipitation in the Toronto area[2] was 921 mm in 2018, a 17% increase from 2017.

[2] *Adapted from http://climate.weather.gc.ca/historical_data/search_historic_data_e.html, Toronto City Station*

Table 4: Bypass Summary

Date	Start of Event	End of Event	Active Duration[1] (hr)	Duration (hr)	Volume (m^3)
January 11-12, 2018	19:50	January 12th 13:30	4.70	17.6	13,249
February 20, 2018	00:30	15:25	7.60	14.9	14,131
February 21, 2018	08:00	11:20	3.3	3.3	956
April 3-4, 2018	23:30	April 4th 06:00	6.5	6.5	31,962
April 16-18, 2018	02:00	April 18th 00:30	46.5	46.5	332,131
April 25, 2018	19:10	23:45	4.6	4.6	14,265
June 13, 2018	17:41	18:28	0.75	0.75	1,200
June 24, 2018	11:13	14:40	3.5	3.5	23,772
July 5, 2018	21:50	23:20	1.5	1.5	8,983
July 22, 2018	10:20	10:50	0.5	0.5	1,377
July 24, 2018	20:40	21:15	0.6	0.6	325
August 6, 2018	19:10	23:45	1.8	1.8	11,556
August 7-8, 2018	22:05	18:30	5.70	20.4	35,581
August 17, 2018	17:25	18:15	0.83	0.83	2,207
August 21, 2018	11:05	14:20	3.25	3.25	13,499
September 10, 2018	09:50	12:30	2.7	2.7	1,428
October 2, 2018	09:06	09:20	0.2	0.2	418

[1] In wet weather the plant may bypass intermittently. The active duration is the period for which the bypass was actively occurring, whereas the duration is the total duration for the event.

3.4.2 Overflows

There were no overflow events at the Humber Treatment Plant in 2018. An overflow is defined as a discharge to the environment from the plant at a location other than the plant outfall or into the plant outfall downstream of the final effluent sampling station.

3.4.3 Spills

There were three spills reported to the MECP in 2018; they are summarized in Table 5 below.

Table 5: Spills Summary

Date	Duration (hr)	Volume (m^3)	Nature of event	Description
May 2, 2018	0.03	3	Unplanned hydraulic restriction.	Primary effluent spill due to closing a gate that caused a hydraulic restriction during a planned construction activities.
August 6, 2018	0.66	1	High flows due to rain.	Primary influent overtopped the influent channel, spilled onto the roadway, and entered a catchbasin which leads to the bypass channel. The plant was experiencing high flows due to rain which surcharged the primary influent channel. The entire volume was disinfected and dechlorinated before discharging to the lake.
October 1, 2018	1.08	1793	High flows due to rain.	Due to process monitoring equipment failure a secondary bypass was initiated before the plant flows reached the secondary treatment capacity as per the ECA.

3.4.4 Abnormal Discharge Events

There were no abnormal discharge events at the Humber Treatment Plant in 2018.

3.5 Complaints

The Humber Treatment Plant received two complaints related to odour. These complaints were received on August 6th and August 13th. All complaints were recorded, investigated by Toronto Water Staff, reported to the MECP, and when possible, followed up on with the complainant. In each case the investigation did not identify any unusual odours, so no corrective action was warranted.

A table of correspondence related to complaints can be found in Section 7.6.

3.6 Effluent Quality Assurance and Control Measures

Analytical tests to monitor required parameters are performed by the Toronto Water Laboratory which is accredited to ISO/IEC 17025 by Canadian Association for Laboratory Accreditation Inc. Plant operation and performance is monitored by licensed operators as

well as by the facility management team. Standard Operation Procedures, emergency plans, equipment preventative and predictive maintenance, and a network of support staff, help ensure a rapid and effective response to issues, and maintain the high quality of the effluent and biosolids. A hybrid Quality and Environmental Management System is also in development and will be reported on in future Annual Reports.

3.7 Odour Reduction Plan

As per Section 8 (4) of the Humber Treatment Plant Amended ECA – Air No. 0858-AEXNV7 issued July 12, 2017, a review of the Odour Reduction Plan summarizing the work progress in 2018, including activities to reduce emissions of odour and total reduced sulphur, the estimated emissions reduction for each activity, and the schedule for completion of each activity can be found in Appendix F.

4 CAPITAL PROJECTS

Under Toronto Water's capital program, the Humber Treatment Plant commenced or continued with the capital works projects and studies listed in Table 6 in 2018.

Table 6: Capital Projects

Project Name	Project Description	Project Stage (Dec 31, 2018)
Cogeneration Upgrades	Refurbishment of cogeneration system to allow use of methane for the generation of electricity and heat.	Complete
Digester 9&10 Rehabilitation	Clean out and repair of digesters 9 and 10 including replacement of gas huts and some mechanical equipment	Complete
Odour Control Upgrades	Preliminary treatment process improvements and odour control system replacement including construction of two new biofilters.	Commissioning
Premise Isolation	Installation of two new backflow preventers for premise isolation and new potable water flow metres	Complete
Secondary Process Upgrades	Refurbishment of south aeration system including expanded return activated sludge pumping station, new plant water pumping station, new phosphorus removal system	Construction
West Substation Upgrades	Electrical Upgrades to existing substation	Construction
ECS Site Office	Prefabricated Building to accommodate City project staff on site	Construction
HVAC Upgrades	Refurbishment of HVAC system and potable water system.	Construction
PLC Platform Upgrade	Replacement of outdated control hardware for reliability	Construction
Primary Pumping and Scum	Upgrade of north primary treatment sludge and scum systems	Construction
TW Operations Centre	Expansion of the operations centre to meet current and future needs	Design
Waste Gas Burner Upgrades	Replacement of existing waste gas burners to meet regulations and improve proves efficiency	Design

Project Name	Project Description	Project Stage (Dec 31, 2018)
Building Condition Assessment	Study to determine the condition of building on site in order to plan maintenance projects and capital upgrades.	Study
Flood Protection Study	Study to determine the adequacy of current flood protection measures	Study
Wet Weather Flow Study	Study to identify ways to handle increased flows and higher lake levels, as well as decrease the quantity and increase the quality of bypass flows.	Study

5 MAINTENANCE

Staff from the Humber Treatment Plant performed a variety of scheduled, preventative, predictive and reactive maintenance on a diverse spectrum of equipment. Equipment availability and reliability ensures operational requirements are achieved.

The annual calibration and maintenance records of flow meters and on-line analysers for regulated parameters was completed in 2018, and found to be within acceptable limits. A summary of effluent monitoring equipment calibration and maintenance performed in 2018 is included in Table 7.

Table 7: Summary of Regulated Monitoring Equipment Calibration and Maintenance

Calibration and/or Maintenance Record	Completion Date
Influent Flow Meter THR-PLT-FIT-2001A - Verification	July 24, 2018
Aeration Flow Meter THR-AER-FIT-0602 - Verification	October 23, 2018
Aeration Flow Meter THR-AER-FIT-0702 - Verification	October 24, 2018
Aeration Flow Meter THR-AER-FIT-0802 - Verification	October 25, 2018
Effluent pH analyzer THR-EPS-AIT-0055 - Calibration	February 8, 2018 and August 15, 2018
Effluent pH analyzer THR-EPS-AIT-0055 - Verification	February 8, 2018 and August 15, 2018
Effluent temperature analyzer THR-EPS-TIT-0053 - Verification	March 13, 2018 and September 28, 2018

The Humber Treatment Plant work areas include all major and auxiliary processes. In 2018, there were a total of 11,394 work orders completed; refer to Appendix G for a summary of maintenance activities as per Conditions 10(6)(c) of the ECA. None of the maintenance activities undertaken at the plant fell under Limited Operational Flexibility; as a result, no Notices of Modifications were submitted to the Water Supervisor as per Condition 10(6)(j) of the ECA. Regular safety inspections and preventative maintenance was performed on the life safety systems at the plant in 2018.

6 UTILITIES

A summary of monthly utility consumption for the previous three years at Humber Treatment Plant is provided in Figure 1. Table 8 below summarizes the total cost and average unit cost for water, hydro, and natural gas. Total annual consumption of potable water, hydro, and natural gas was 401,173 m^3, 48.7M kWh, and 2.8M m^3, respectively.

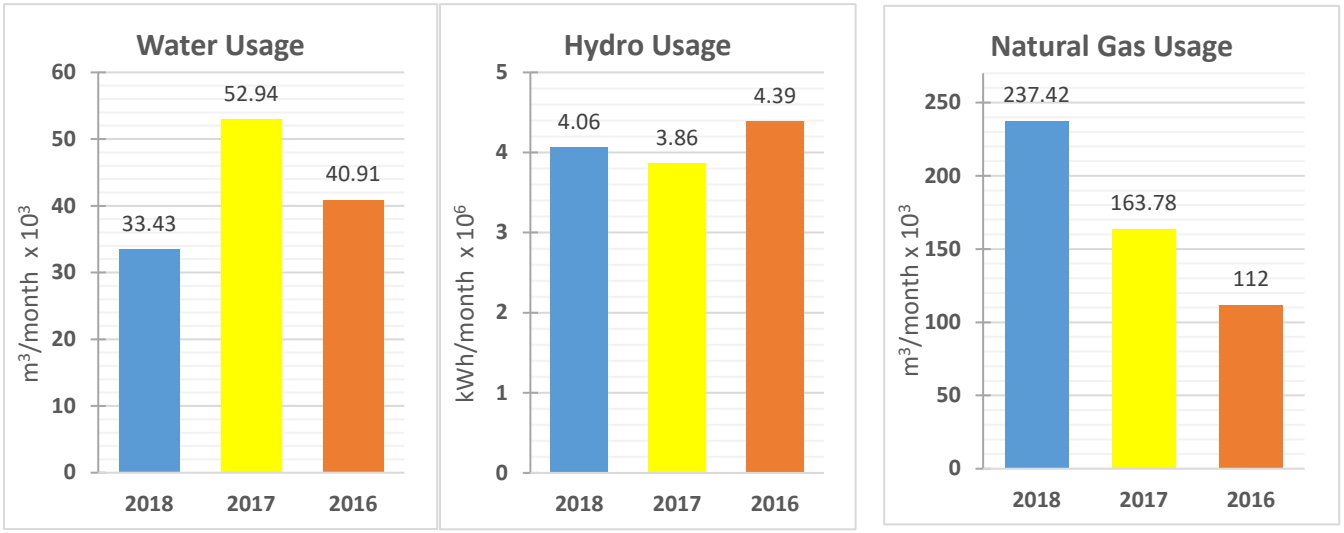


Figure 1: Annual Utility Consumption (Water, Hydro, Gas)

Table 8: Average Unit and Total Utility Cost

Utility	2018	2017	2016
Water Unit Cost ($/m3)	4.00	3.81	3.63
Water Total Cost ($/year)	1.61M	2.42M	1.78M
Hydro Unit Cost ($/kWh)	0.10	0.10	0.11
Hydro Total Cost ($/year)	4.84M	4.43M	5.59M
Natural Gas Unit Cost ($/m3)	0.23	0.24	0.24
Natural Gas Total Cost ($/year)	648,304	470,741	317,335

There was a 37% decrease in potable water consumption in 2018 compared to 2017. For portions of 2017, the effluent reuse water system was out of service, requiring the use of potable water. The problems experienced in 2017 were corrected, reducing the need for potable water usage.

The 45% increase in natural gas is due to one digester-gas fed boiler being out of service during the winter. Because the digester gas could not be used, additional natural gas was needed for process and domestic heat.

7 ADMINISTRATION

7.1 Operations and Maintenance Costs

The 2018 plant direct operational costs are broken down into five categories: Salaries and Benefits, Materials and Supplies, New Equipment, Services and Rents, and Inter-Divisional Charges. Materials and Supplies is further segregated into Utilities, Machine & Equipment Parts, Chemicals and Other Materials and Supplies. A breakdown of annual operations and maintenance costs for the past three years is illustrated in Figure 2 . Overall, operational costs increased by 5.5% from 2017.

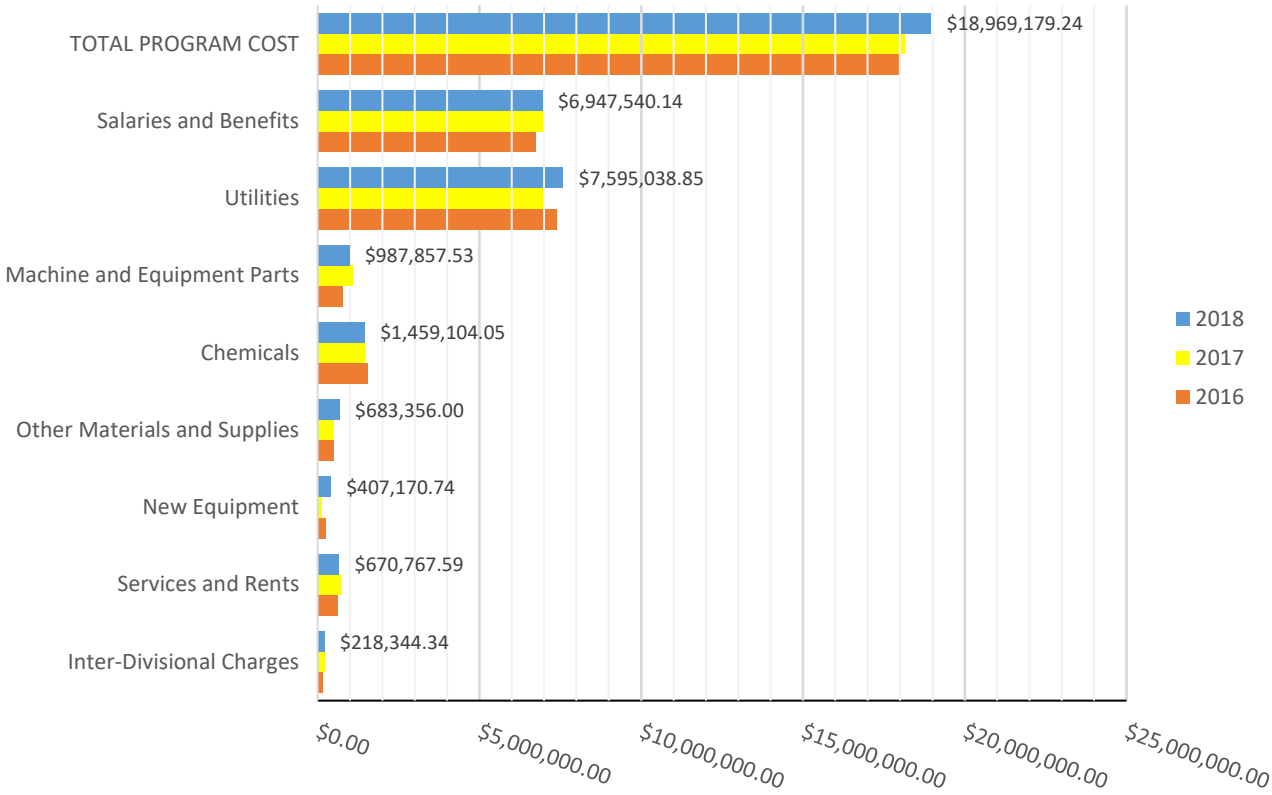


Figure 2: Operations and Maintenance Cost Breakdown

7.2 Human Resources

Plant Staffing at the Humber Treatment Plant in 2018 is shown in Table 9.

Table 9: Plant Staffing

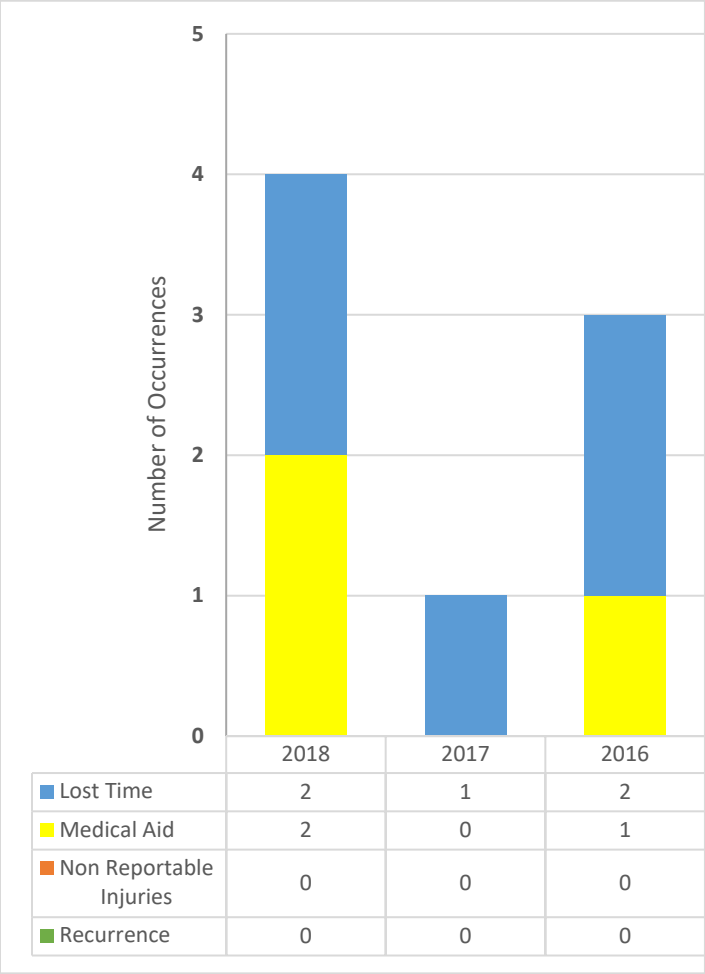
Position	Number of FTE[1]
Plant Manager	1
Senior Engineer	2
Area Supervisors	4
Electrical & Instrumentation Specialist	1
Electricians	3
Plant Technicians	20
Industrial Millwrights	20
Electrical Instrumentation Control Technicians	7
Wastewater Treatment Plant Workers	6
Support Assistant/Materials Management	3
Engineering Technologist	1
Seasonal Temporary	1.5
Total FTE Positions	69.5

[1] FTE refers to Full Time Equivalent staff. Seasonal staff are considered 0.5 FTE staff.

7.3 Occupational Health & Safety

Continuous efforts are made to ensure a safe working environment at the Humber Treatment Plant. The Joint Health and Safety Committee (JHSC) assists management in resolving issues through regular meetings and monthly workplace inspections. Plant Health and Safety statistics for the Humber Treatment Plant are included in Figure 3.

As of December 31, 2018, there were four health and safety incidents and a total of 5 lost time days in 2018 due to work related injuries.



	2018	2017	2016
Lost Time	2	1	2
Medical Aid	2	0	1
Non Reportable Injuries	0	0	0
Recurrence	0	0	0

Figure 3: Humber Treatment Plant Health & Safety Injury Summary[3]

7.4 Staff Training and Development

The Strategic Planning and Workforce Development unit of Toronto Water facilitates a comprehensive training program for all staff.

Training attended by Humber Treatment Plant operations and skilled trades staff in 2018 includes the list of courses shown in Appendix E. Some of these courses were eligible for Continuing Education Units (CEU's) from the Ontario Environmental Training Consortium (OETC). Additional training related to the start-up and commissioning of new equipment/systems installed as part of the capital program was provided as required.

[3] The previously reported values for 2017 and 2016 have been changed to reflect the status of those WSIB claims as of December 31st 2018.

7.5 Utility Operator Certification

Toronto Water trains and provides the required resources to ensure all operators achieve and maintain Class IV certifications. In addition, all skilled trade positions are required to achieve and maintain a Class I operator's licence. As part of this initiative, general operational/process training was delivered in order to prepare staff for any certification examination that they need to write. Table 10 summarizes the status of operator certification at the Humber Treatment Plant in 2018.

Table 10: Wastewater Treatment Certificates

Class Level	Number of Licenses
Class IV	16
Class III	2
Class II	4
Class I	15
O.I.T.	12
Total	49

7.6 MECP/MOL Correspondence

There were no orders issued by the Ministry of the Environment, Conservation and Parks (MECP). There was one order from the Ministry of Labour (MOL) regarding improper supplier labels on hazardous products. One time order was issued to label the products, which was complied with on the day of the visit.

Reports were submitted to the MECP for the two odour complaints received at the plant in 2018, one noise complaint, as well as the 17 bypass events. Table 11 summarizes the correspondence submitted to the MECP and MOL for the Humber Treatment Plant. Correspondence related to spills and bypassed can be referenced in sections 3.4.3 and 3.4.1.

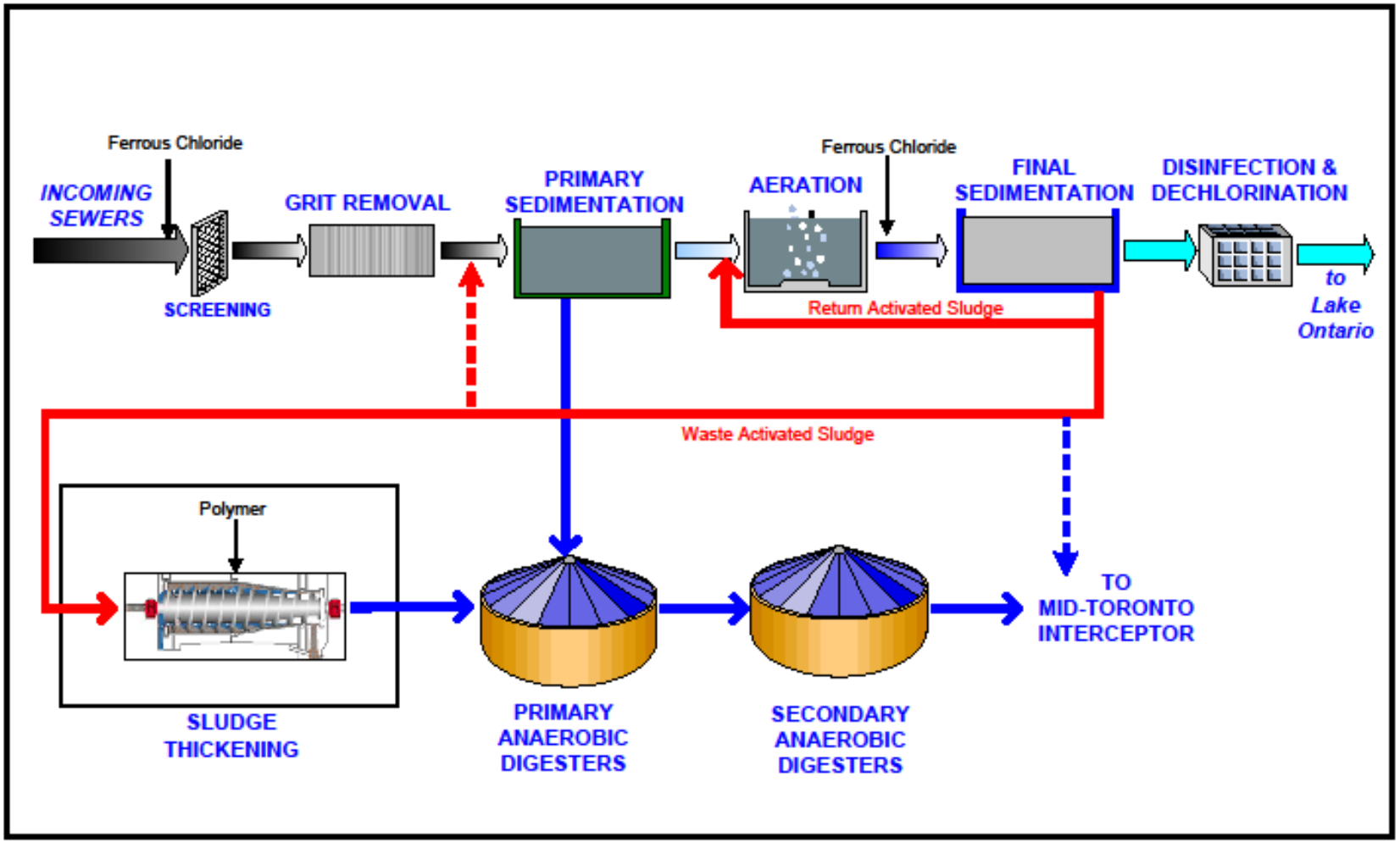
Table 11: Correspondence submitted to the MECP and MOL

Event Date	Type	Description	Resolution	Resolution Date
09-May-18	Noise	Low continuous humming noise found to be due to vibration in the odour control air ductwork to the central biofilter.	Fan speed slightly lowered, which resulted in the elimination of the noise	09-May-18

Event Date	Type	Description	Resolution	Resolution Date
06-Aug-18	Odour	"Noxious gas" smell coming from plant was smelt from across the street.	Investigation by plant staff did not identify any unusual odours. Complainant was anonymous and therefore could not be contacted with this information.	06-Aug-18
13-Aug-18	Odour	Complainant from a nearby business claimed odour was coming from the plant.	Investigation by plant staff did not identify any unusual odours. Complainant was anonymous and therefore could not be contacted with this information.	14-Aug-18
Consent Letters				
None				
Notice of Start up				
October 1, 2018		Aeration Tank 5		
MECP Inspection				
No Inspection				
MOL Correspondence				
November 20, 2018		An order was issued to apply workplace labels to two sacks of materials stored on site.	The workplace labels were applied to the sacks immediately and a Notice of Compliance was sent by fax on the same day.	November 20, 2018

APPENDIX A – Plant Schematic

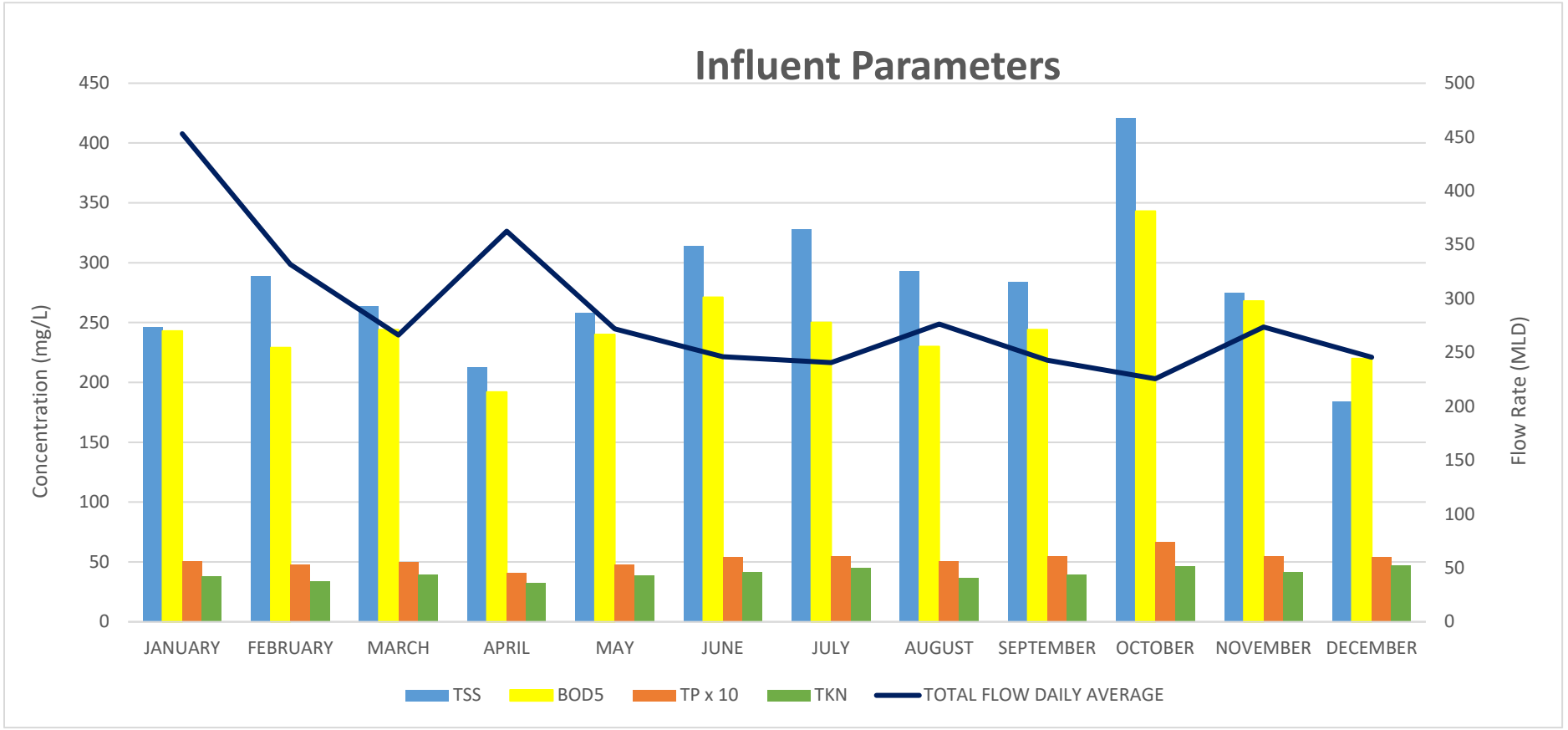
APPENDIX A – Plant Schematic



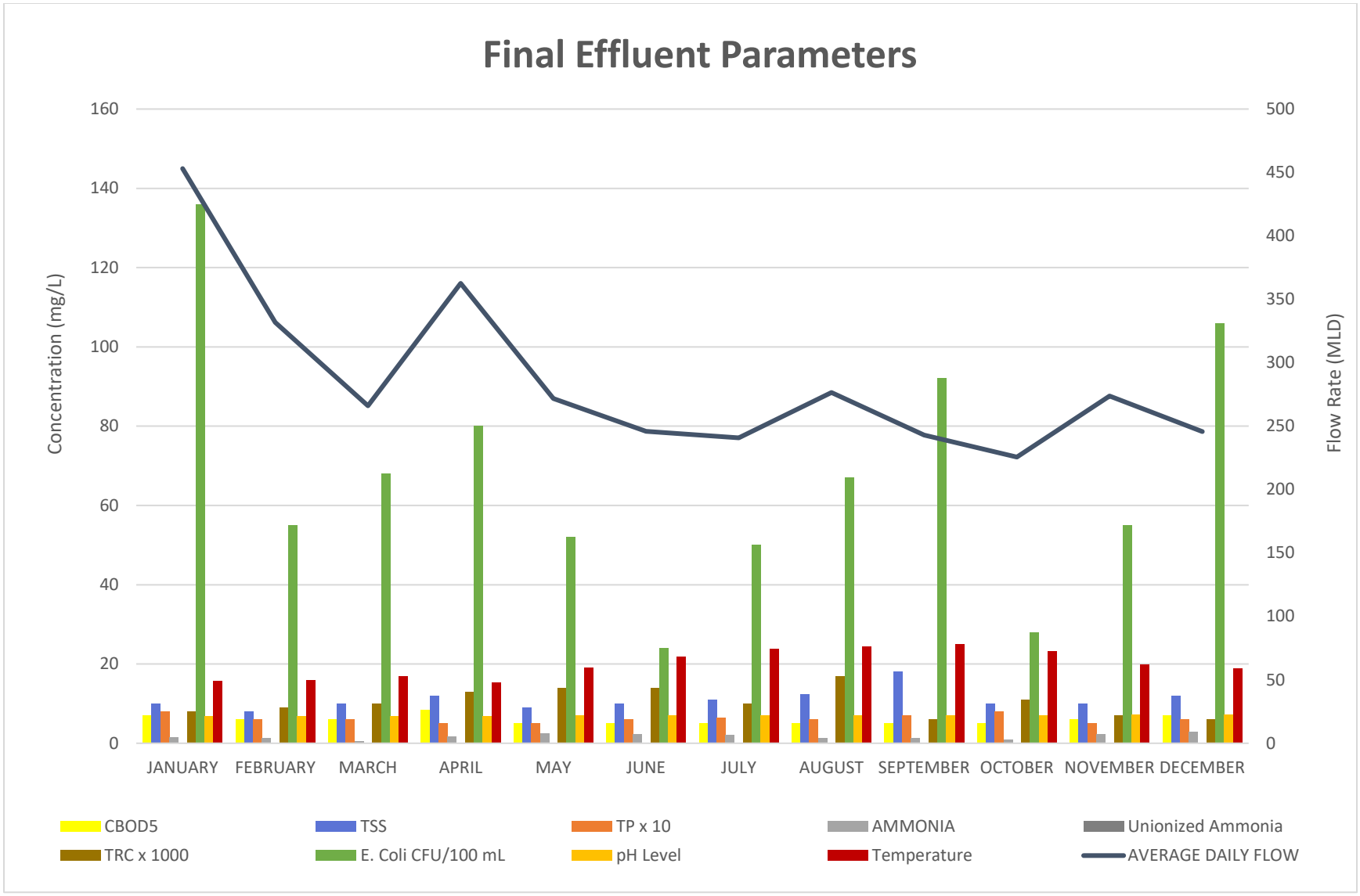
Process Flow Diagram for Humber Wastewater Treatment Plant

APPENDIX B – Influent and Effluent 2018 Performance Charts

APPENDIX B – Influent and Effluent 2018 Performance Charts



APPENDIX B – Influent and Effluent 2018 Performance Charts



APPENDIX C – Historical Performance Data

APPENDIX C – Historical Performance Data

	Units	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008
Influent Parameters												
Flow	ML/day	286.1	331.7	257.3	269	280.5	312	287.5	379	362	300	331.3
Total Annual Flow	ML	104,417	121,062	94,168	98,174	102,364	113,709	105,444	137,971	132,289	113,060	121,266
Total Suspended Solids (TSS)	mg/L	281	301	331	369	356	318	405	446	290	354	323
Biochemical Oxygen Demand (BOD_5)	mg/L	248	255	299	318	295	238	261	267	250	212	164
Total Phosphorus (TP)	mg/L	5.2	5.3	5.8	5.8	5	4.4	4.9	5.1	4.8	4.6	4.8
Total Kjeldahl Nitrogen (TKN)	mg/L	40.0	39.8	45.2	42.7	38.4	39.31	43.42	40.4	35.17	35.9	33.3
Preliminary Treatment												
Grit and Screenings	tonnes/day	4.1	2.1	1.6	2.2	2.1	3.4	1.8	2.2	14.5	2.4	2.7
Primary Treatment												
TSS	mg/L	96	102	94	97	101	151	148	126	100	97	104
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	mg/L	141	118	158	156	138	142	160	145	139	106	117
Secondary Treatment												
Aeration Loading	kg $CBOD_5$/ m^3.day	0.44	0.41	0.38	0.39	0.37	0.4	0.47	0.57	0.45	0.32	0.36
Mixed Liquor Suspended Solids	mg/L	2839	2842	2953	2838	2998	2885	2151	2741	2384	2238	1292
Final Effluent												
Final Effluent Daily Average Flow	ML/day	285	321	257	268	276	306	288	380	361	308	332
TSS	mg/L	11	13	13	11	12	13	15.7	13	12	14	16
TSS Loading Rate	kg/day	3157	4322	3341	2952	3306	4050	4523	4970	4194	4200	5138
cBOD5	mg/L	5.9	6.6	5.7	5.4	4.8	6.0	6.0	7.6	6.1	7	6
cBOD5 Loading Rate	kg/day	1678	2202	1465	1449	1322	1869	1728	2880	2209	2100	1989
TP	mg/L	0.6	0.8	0.7	0.8	0.7	0.7	0.6	0.4	0.5	0.7	0.7
TP Loading Rate	kg/day	178	250	180	210	210	202	184	166	179	210	232
Escherichia Coli (E. Coli)	CFU/100 mL	68	72	29	52	30	31	26	51	46	24	14
pH	-	7	8	7.2	7.4	7	7	7	7.6	7.5	7.3	7
Total Residual Chlorine	mg/L	0.0065	SBS (P) /0.009	SBS (P)	SBS (P)	SBS (P)	-	-	-	-	-	-
Total Kjeldahl Nitrogen (TKN)	mg/L	3.3	3.2	2.66	2.2	2.1	2.0	3.2	5.8	4.3	9.7	12.2
Total Ammonia Nitrogen	mg/L	1.7	1.6	1.2	1.4	0.9	0.7	1.0	3.0	5.4	6.6	10.0
Temperature	degrees Celsius	20	15.8	17.6	18.9	18.7	20.0	21.0	19.6	20.3	19.5	19.7

APPENDIX C – Historical Performance Data

	Units	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008
Solids Handling												
Primary Sludge Treated	m^3/day	2,627	2,813	2689	2723	3495	2639	2532	2368	2661	3100	2920
Primary Sludge Total Solids (TS)	%	2.1	1.9	-	-	-	-	-	-	1.69	2.19	1.84
Primary Sludge Total Volatile Solids (TVS)	%	76.7	73.6	-	-	-	-	-	-	78.7	71.29	76
Waste Activated Sludge (WAS) to Thickening	m^3/day	3,697	3,776	3573	3135	3782	2984	3779	4536	4794	3960	3780
WAS SS	mg/L	9,499	8,806	8630	9448	8863	10391	9012	7580	6877	7078	5676
Thickened WAS (TWAS) TS	%	3.7	4.6	4	4.2	4.4	5.3	4.7	4.7	4.1	4.80%	4.30%
TWAS VS	%	74.9	77.6	75	78.6	78	79	78.7	78.9	82.2	81%	79.80%
TWAS Treated	m^3/day	961	714	598	350	512	464	726	739	937	850	940
Digested Solids to ABTP	DT/day	73	80	59	57	64	57	54	48	39.1	40.6	38.8
WAS to ABTP	DT/day	4.9	4.9	5.1	17	11.7	5.8	1.7	4.7	4	14.8	24.9
Digester Gas Generated	10^3 m^3/day	26.7	26.2	28.1	25.4	24.6	20.3	21.3	17.5	15.6	15.5	23.2

APPENDIX D – Influent and Effluent Metal Concentrations

APPENDIX D – Influent and Effluent Metal Concentrations

Influent (Daily Composite tested once/month for metals)

Parameter Units	Arsenic mg/L	Cadmium mg/L	Chromium mg/L	Cobalt mg/L	Copper mg/L	Iron mg/L	Lead mg/L	Manganese mg/L	Mercury mg/L	Nickel mg/L	Zinc mg/L
January	0.005	0.002	0.00682	0.002	0.102	1.57	0.0025	0.068	0.00005	0.00912	0.168
February	0.005	0.002	0.0102	0.002	0.114	8.75	0.00511	0.112	0.00005	0.00971	0.161
March	0.005	0.002	0.00643	0.002	0.102	1.94	0.0025	0.0706	0.00005	0.00818	0.183
April	0.005	0.002	0.00571	0.002	0.106	1.04	0.0025	0.0633	0.00017	0.0142	0.166
May	0.005	0.002	0.00993	0.002	0.0904	2.63	0.0025	0.077	0.00005	0.00874	0.152
June	0.005	0.002	0.00593	0.002	0.105	1.21	0.0025	0.0606	0.000141	0.00724	0.158
July	0.005	0.002	0.00746	0.002	0.111	1.27	0.0025	0.0654	0.00005	0.00674	0.181
August	0.005	0.002	0.00521	0.002	0.0987	1.3	0.0025	0.0683	0.00005	0.0104	0.13
September	0.005	0.002	0.00727	0.002	0.103	1.55	0.00564	0.0648	0.00005	0.0121	0.146
October	0.005	0.002	0.0144	0.002	0.134	1.53	0.00611	0.0705	0.00005	0.0119	0.241
November	0.005	0.002	0.00737	0.002	0.123	1.26	0.00557	0.0677	0.000106	0.00823	0.255
December	0.005	0.002	0.00626	0.002	0.118	1.17	0.0025	0.0647	0.00005	0.0077	0.215
Annual Average	***0.005***	***0.002***	***0.007749***	***0.002***	***0.10893***	***2.102***	***0.003536***	***0.071075***	***0.000072***	***0.00952***	***0.1797***

Final Effluent (Daily Composite tested once/month for metals)

Parameter Units	Arsenic mg/L	Cadmium mg/L	Chromium mg/L	Cobalt mg/L	Copper mg/L	Iron mg/L	Lead mg/L	Manganese mg/L	Mercury mg/L	Nickel mg/L	Zinc mg/L
January	0.005	0.002	0.002	0.002	0.0149	0.41	0.0025	0.0386	0.00005	0.00619	0.0485
February	0.005	0.002	0.002	0.002	0.0146	0.337	0.0025	0.0436	0.00005	0.00542	0.0453
March	0.005	0.002	0.002	0.002	0.0159	0.318	0.0025	0.0402	0.00005	0.00553	0.0524
April	0.005	0.002	0.002	0.002	0.0189	0.443	0.0025	0.0528	0.00005	0.00524	0.0525
May	0.005	0.002	0.002	0.002	0.0147	0.416	0.0025	0.0634	0.00005	0.00623	0.0443
June	0.005	0.002	0.002	0.002	0.0132	0.481	0.0025	0.0587	0.00005	0.00568	0.0393
July	0.005	0.002	0.002	0.002	0.0117	0.662	0.0025	0.0624	0.00005	0.00533	0.0335
August	0.005	0.002	0.002	0.002	0.0139	0.827	0.0025	0.0562	0.00005	0.00724	0.0322
September	0.005	0.002	0.002	0.002	0.0144	1.42	0.0025	0.0602	0.00005	0.00632	0.0304
October	0.005	0.002	0.002	0.002	0.0152	0.545	0.0025	0.0458	0.00005	0.00608	0.0338
November	0.005	0.002	0.002	0.002	0.0134	0.523	0.0025	0.0448	0.00005	0.0025	0.0317
December	0.005	0.002	0.002	0.002	0.0206	0.647	0.0025	0.0418	0.00005	0.00604	0.0349
Annual Average	***0.005***	***0.002***	***0.002***	***0.002***	***0.01512***	***0.5858***	***0.0025***	***0.05071***	***0.00005***	***0.005650***	***0.03990***

Data in red italics is half the MDL.

APPENDIX E – Digested Sludge Analysis

APPENDIX E – Digested Sludge Analysis

	Arsenic	Cadmium	Cobalt	Chromium	Copper	Mercury	Molybdenum	Nickel	Lead	Selenium	Zinc
Limit (1)	*170*	*34*	*340*	*2800*	*1700*	*11*	*94*	*420*	*1100*	*34*	*4200*
January	2.3	0.3	3.5	39.5	616	0.379	6.09	28.5	28.1	2.0	727
February											
March											
April	1.4	0.7	3.7	40.4	474	0.362	5.70	20.2	30.5	2.4	532
May	1.0	0.3	2.7	35.6	324	0.175	4.07	16.8	35.2	1.6	366
June	2.0	0.6	3.2	40.9	459	0.362	7.81	18.2	19.6	3.1	609
July											
August	1.4	0.6	5.5	65.4	763	0.780	11.06	29.6	30.7	5.0	883
September											
October	0.83	0.3	2.0	23.0	270	0.305	4.45	12.5	13.4	0.8	260
November											
December											
Annual Average	1.5	0.47	3.43	40.8	484	0.39	6.53	21.0	26.2	2.50	563

All values are expressed in terms of mg metal / kg digested sludge dry weight

(1) As per MECP regulations for sludge utilization on agricultural lands. All sludge from HTP received further treatment at Ashbridges Bay Treatment Plant

APPENDIX F – Odour Reduction Plan

Humber Treatment Plant
Odour Reduction Report

Prepared by:

Vanessa Szonda, P.Eng
Senior Engineer, Toronto Water

March 31, 2019

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Purpose

This report is intended to detail the progress of the implementation of the Odour Reduction Plan, as required under Environmental Compliance Approval No. 0858-AEXNV7 (the ECA), issued July 12, 2017. A copy of the Odour Reduction Plan can be found in Appendix A: Odour Reduction Plan.

Scope

The scope of this report is to detail the progress of the installation of the *Proposed Equipment*, in the ECA which will impact odours at the plant.

The ECA also lists equipment which is not expected to have an impact on odour at the plant. This includes modifications to the aeration tanks, the disinfection facility, and the decommissioning of existing odour control equipment. As they are not anticipated to have any impact on odour, they are beyond the scope of this report.

Background

In 2010, the City of Toronto (the City) hired Stantec Consulting Inc. (Stantec) to provide engineering design, construction administration and post construction services of odour control facilities to drastically reduce nuisance odours at the facility's property line and beyond. This included several upgrades to process equipment and odour handling facilities at the plant.

Odour Control Equipment

A central component of the Odour Control Project is the construction of a centralized Biofilter to control emissions from the Headhouse and South Grit Building, the North Grit Building, and the north primary tanks influent and effluent channels. The biofilter includes:

- Four cells, 15.5 m by 32.2 m, with an organic media depth of 1.22 m
- An irrigation system
- Two separate 2.2 m stacks extending 4.2 m above grade, with a maximum flow rate of 19.8 m^3/s

In addition to the centralized biofilter, a second biofilter has been constructed at the south end of the south primary tanks. This biofilter treats air from the influent and effluent channels of the south primary tanks and will consist of:

- 3 cells, 8 m by 5.5 m, with an organic media depth of 1.22 m
- An irrigation system
- An open area discharge, with a maximum volumetric discharge of 2.36 m^3/s

The third odour reducing component of the project includes a granular activated carbon (GAC) scrubber unit, which treats air from the Headhouse screen room. The GAC unit has:

- 45 m^3 of GAC
- A maximum discharge rate of 16 m^3/s, through a 1.21 m stack, located 4 m above grade

Process Upgrades

The Headhouse and South Grit Building has undergone extensive renovations to ensure process reliability, as well as ensure that odours are contained and treated. The work in this area includes:

- Replacement of 2 bar screens to increase reliability and enable them to be enclosed at all times
- Replacement of the conveyor system to increase reliability and enable them to be enclosed at all times
- Modifications to the vortex system replace the classifiers and air lift system with a grit pumping system and merge the grit slurry handling with the north grit facility
- Decommission 4 general building exhaust systems
- Installation of a new truck loading bay for screenings
- Installation of a standby diesel generator to ensure continuous operation of critical equipment
- Construction of a new electrical building

North Grit Building

- Upgrades to the grit tanks to use a screw conveyor for grit removal
- Installation of new grit handling pumps, hydrocyclones and classifiers
- Installation of a new grit handling facility and loading bay
- Construction of a new electrical building

Additionally, the project scope included decommissioning the existing HVAC and odour control equipment and allowing the aeration tanks to vent to atmosphere.

The project was tendered in late 2013, and the order to commence issued to Walsh Construction Canada (WCC) on April 14, 2014. The contract value is $58,640,220, with an original contract completion date of February 6, 2017. The completion date has been extended, and the project is expected to be completed by the second quarter of 2019. WCC, Stantec, and the City have been actively working to construct the works in an accordance with the tender documents and schedules, however the project continues to experience delays.

2018 Progress

In 2018, work on the Odour Control Project continued, and significant progress was made. The central biofilter has essentially been completed and is running under the control of the contractor. The biofilter and all associated systems and ductwork have been completed, including the balancing and commissioning of the system. The central

biofilter fans and ductwork can be seen in Figure 1. Note, the biofilter is located underground.

Figure 1: The Central Biofilter fans

The GAC unit continues to run and is currently treating building air from the headhouse at its intended capacity or 6 air changes per hour. Foul air is now being extracted from process equipment and treated through the central biofilter (Figure 2).

Figure 2: The GAC Unit

The construction of the south biofilter has been completed has been commissioned (Figure 3). A biomass has been established in the filter, which should result in a 20% reduction in odours at the property line. Odour reductions will be confirmed by source testing upon completion of the project.

Figure 3: The South Biofilter

All major upgrades have been completed and have been commissioned. These include:

- Two new bar screens and associated conveyor systems
- A new loading bay (Figure 4)
- Three north grit tanks
- The north grit loading bay, including classifiers and conveyors, (Figure 5)
- Six south grit vortexes
- Air handling equipment, including and testing and balancing of the system

Figure 4 The new headhouse loading bay (left) and screenings conveyor systems (right)

Figure 5: The North Grit Building loading bay has been commissioned

Odour Reductions Achieved in 2018

The GAC unit was commissioned in 2016 and was placed in its intended mode of operation. Overall, this should result in a 10% reduction in odour at the fence line.

The south biofilter was commissioned in the first quarter of 2017, and is currently treating the foul air from the influent and effluent toughs and channels of the south primary tanks. This should have resulted in a 20% decrease in odours at the property line. This will be confirmed by source testing upon completion of the project.

The central biofilter is has been commissioned and is running. This should result in a 60% reduction of odours at the fence line.

Odour reductions will be measured and confirmed by source testing once outstanding deficiencies on the project are addressed and the project reaches substantial completion.

Complaints Received in 2018

Two odour complaints were received in 2018. All complaints were investigated and reported to the Water Supervisor as per the requirements in the ECA. A copy of the complaint reports can be found in Appendix B: Odour Complaints.

Next Steps

The City continues to work with Stantec and WCC to move forward with the project. Construction and commissioning of process equipment is ongoing, and the project is expected to be completed by the second quarter of 2019. Once the project is complete, source testing will begin.

Appendix A: Odour Reduction Plan

Location	Plan	Percent Odour Reduction	Current Progress	Target date
Headhouse and South Grit	Replace remaining 2 bar screens to increase reliability and enable them to be enclosed at all times	20%	Complete	
	Replace conveyor system to increase reliability and enable them to be enclosed at all times		Complete	
	Modify vortex system to no longer require the classifiers or an air lift system in this location		Complete	
	Decommission 4 general building exhaust systems		Complete	
	New centralized biofilter to treat foul process air		Complete	
	Construction of a standby diesel generator		Complete	
	New Activated Granular Carbon Unit to extract and treat foul building air	10%	Complete	
North Grit Building	Collection and treatment of emissions from the 3 aerated grit tanks through the new centralized biofilter	20%	Complete	
	Collection and treatment of emissions from the grit tank room and loading bay areas through the centralized biofilter		Complete	
	Decommission existing general building ventilation system		Complete	
	Decommission the existing exhaust system for aerated grit tanks		Complete	
North Primary Tanks	Installation of covers over the influent and effluent channels, effluent weirs, and overflow channel	20%	Complete	
	Treatment of foul air from below the covers through a new centralized biofilter		Complete	
South Primary Tanks	Installation of covers over the influent and effluent troughs	20%	Complete	
	Treatment of foul air from below the covers through a new south primary biofilter		Complete	
Aeration Tanks	New aeration piping and diffusers	N/A	Construction	N/A
	New ventilation scheme that will involve vent stacks to allow air to discharge to the atmosphere		Construction	N/A
Disinfection Facility	New Sodium Hypochlorite Tanks (1-3)	N/A	Complete	
	New Sodium Hypochlorite Tanks (4-8)		Complete	
	New welding fume hood		Complete	
	New standby diesel generator		Complete	
	Decomission chlorine gas scrubbers		Complete	
Air Scrubbers/ Ozone	Decommission air scrubbers and ozone building	N/A	Complete	N/A

Updated February 28, 2019 by V. Szonda

Appendix B: Odour Complaints

TORONTO Water

Vanessa Szonda
Senior Engineer
Humber Treatment Plant

130 The Queensway
Etobicoke, Ontario M8Y 1H9

Tel: 416-392-2942
Fax: 416-392-4514

Environmental Compliance Approval 0858-AEXNV7

August 7, 2018

York-Durham District Office
230 Westney Rd. S.
5th floor
Ajax ON L1S 7J5

Attn: Shannon Boland

Re: Humber Treatment Plant Noise Complaint

Dear Ms. Boland,

On Monday, August 6, 2018, an odour complaint was called in to 311. The complainant was at the Sobey's plaza across the street and noticed a "noxious gas smell" coming from the Humber Plant. The complaint was investigated by the Operator in Charge, and no unusual odours were detected. The odour complaint form is attached.

The complainant chose to remain anonymous and could not be contacted for a follow up.

Should you have any questions, please do not hesitate to contact me.

Best regards,

Vanessa Szonda, P.Eng
Senior Engineer, Humber Treatment Plant
City of Toronto, Toronto Water

CC: Voitke Kozakiewicz, P.Eng – Plant Manager, Humber Treatment Plant
Satyanand Goolsarran – Environmental Health and Safety Representative
Krishna Mahadeo – Area Supervisor Process Operations and Maintenance

TORONTO Water **Humber Treatment Plant**

Type of Complaint: ☑ Odor ☐ Noise ☐ Other: _____

Section A: Complaint Report

Received by: Igor Mazunchenko
Complainant's Name: Anonymous
Date of Complaint: Aug 06/18 Time of Complaint: 22:58
Address: N/A Phone: N/A
Complaint Details: Lady were walking with her dog along The Queensway (Sobeys Plaza area) when noted a noxious gas smell coming from Humber Plant.

Section B: Investigation Report

Investigated by: I. Mazunchenko
Date: Aug 06/18 Time: 23:15
Weather conditions: ☐ Clear ☐ Cloudy ☑ Humid ☐ Inversion ☐ Other: _____
Wind Direction: SW (225°) Wind intensity: Light Temperature: +23°C
Were symptoms of the complaint evident at the time of the investigation: ☐ Yes ☐ No
Explain: Walked around Plant and outside (The Queensway); checked Odour Control System - OK. Head House and Grit Bldg. Overhead Doors closed.
Was the investigator able to determine the cause? ☐ Yes ☑ No
Details: No any odours have been determined at that time.

Were there any remedial actions required and/or attempted? ☐ Yes ☑ No
Details: _____

Resolution/Conclusion: _____

Section C: Follow-Up Report

Completed by: I. Mazunchenko
Date: Aug 06/18 Time: 23:30
Were others contacted regarding the complaint? ☐ Yes ☑ No
Details: _____

Was a follow-up call made? ☐ Yes ☑ No Date: _____ Time: _____
Additional Notes: Complainant wants remain to be Anonymous
Initial call came from 311.

Reviewed By: VSzeto Date: Aug. 7/18

TORONTO Water

Vanessa Szonda
Senior Engineer
Humber Treatment Plant

130 The Queensway
Etobicoke, Ontario M8Y 1H9

Tel: 416-392-2942
Fax: 416-392-4514

Environmental Compliance Approval 0858-AEXNV7

August 14, 2018

York-Durham District Office
230 Westney Rd. S.
5th floor
Ajax ON L1S 7J5

Attn: Shannon Boland

Re: Humber Treatment Plant Noise Complaint

Dear Ms. Boland,

On Monday, August 13, 2018, an odour complaint was called in to the plant control room. The complainant was at 150 Park Lawn Rd (Starbucks) and complained of a bad smell coming from the Humber Plant. The complaint was investigated by the Operator in Charge, and no unusual odours were detected. The odour complaint form is attached.

The complainant chose to remain anonymous and could not be contacted for a follow up.

Should you have any questions, please do not hesitate to contact me.

Best regards,

Vanessa Szonda, P.Eng
Senior Engineer, Humber Treatment Plant
City of Toronto, Toronto Water

CC: Voitke Kozakiewicz, P.Eng – Plant Manager, Humber Treatment Plant
Satyanand Goolsarran – Environmental Health and Safety Representative
Krishna Mahadeo – Area Supervisor Process Operations and Maintenance

TORONTO Water Humber Treatment Plant

Type of Complaint: ☒ Odor ☐ Noise ☐ Other: _____

Section A: Complaint Report

Received by: T. Epp
Complainant's Name: N/A
Date of Complaint: Aug. 13/18 Time of Complaint: 1700
Address: 150 Parklawn Rd. Phone: NA
Complaint Details: Bad odor coming from Plant.

Section B: Investigation Report

Investigated by: T. Epp
Date: Aug 13/18 Time: 1800
Weather conditions: ☐ Clear ☒ Cloudy ☒ Humid ☐ Inversion ☐ Other: _____
Wind Direction: NW 10 km/hr Wind intensity: _____ Temperature: 25°C
Were symptoms of the complaint evident at the time of the investigation: ☐ Yes ☐ No
Explain: No Irregular odors.

Was the investigator able to determine the cause? ☐ Yes ☒ No
Details: _____

Were there any remedial actions required and/or attempted? ☐ Yes ☒ No
Details: All Doorways to headhouse and grit building closed. Bio filters On.

Resolution/Conclusion: _____

Section C: Follow-Up Report

Completed by: Vanessa Szanda
Date: August 14, 2018 Time: 10:00
Were others contacted regarding the complaint? ☐ Yes ☒ No
Details: _____

Was a follow-up call made? ☐ Yes ☒ No Date: _____ Time: _____
Additional Notes: No contact information available

Reviewed By: Vanessa Szanda Date: Aug. 14, 2018

APPENDIX G – Maintenance Activities

APPENDIX G – Maintenance Activities

Solids Handling (Work Area 1)

Work Area 1 includes WAS thickening centrifuges, anaerobic digesters and gas collection, compression, and burner systems. A total of 2537 work orders were closed in this work area in 2018. The following maintenance on major structures, equipment, apparatus, mechanism or thing forming the Works was completed by Work Area 1 in 2018:

- Monthly valve exercise:
    - Centrate pump isolation valve.
    - Centrifuge feed pump valves.
    - MTI Line isolation valves.
    - TWAS Transfer Pump isolation valves.
- Monthly North Plant scum hopper chute and paddle cleaning.
- Quarterly inspections:
    - Waste gas burners.
    - TWAS transfer pumps.
    - MTI transfer pumps.
- Bi-annual cleaning and inspection of waste gas burner stack, thermal valve and flame arrestor.
- Bi-annual lubrication of bearings:
    - Sludge recirculation pumps.
    - MTI transfer pump.
    - Sludge transfer pumps.
- Bi-annual inspections:
    - Natural gas pilot pressure regulating valve.
    - Waste gas burners.
    - TWAS Transfer pumps (including motor lubrication).
    - MTI transfer pumps (including motor lubrication).
- Bi-annual North Plant scum collector cleaning and lubrication.
- Annual lubrication and exercise of digester routing and sample valves.
- Annual Inspections/maintenance:
    - Centrate pump drive sheaves.
    - Centrifuge feed pumps.
    - Sludge recirculation pumps (including lubrication).
    - Sludge transfer pumps (including lubrication).
    - Centrifuge flexible chute connections.
    - MTI transfer pumps.
    - TWAS pumps.
- 2000 hour centrifuge inspection and lubrication on CF-4011, CF-4031, CF-4041, CF-4071.
- 4000 hour centrifuge lube oil filter change and oil reservoir level check CF-4031.
- 2 year valve and piping inspections on primary and secondary digesters.
- 3 year TWAS pump back plate and lobe inspection.

APPENDIX G – Maintenance Activities

- Added handles to P-3030 and P-3070 belt guard cover.
- Overhaul of pump P-2368, P-3211, P-2369.
- Installed guard rail around coffin covers for digester 8.
- Replaced bearing housing on P-2531.
- Replace seal pressure gage on P-3272.
- Replaced Seal Water solenoid on P-2368, P-2369, P-3271, P-2318.
- Replaced spools and elbows on digester transfer pumps P-3211, P-3212, P-3271, P-3272.
- Put Digester 9 back in service.
- Modified all sludge transfer and recirculation pumps to accommodate cartridge mechanical seals.

Liquid Primaries (Work Area 2)

Work Area 2 encompasses preliminary treatment processes including influent bar screens, aerated grit chambers, vortex grit chambers, and primary clarifiers. A total of 2272 work orders were closed in this work area in 2018. The following maintenance on major structures, equipment, apparatus, mechanism or thing forming the Works was completed by Work Area 2 in 2018:

- Monthly North Plant bridge lubrication.
- Monthly scum transfer pump checks.
- 2 month bar screen pillow block lubrication.
- 2 month inspection and lubrication of bar screen rake switch and arm pivot brushing.
- 3 month bar screen carriage drive chain lubrication.
- 6 month inspections:
    - Bar screen conveyers.
    - Bar screen rake blades and shoes.
    - Primary scum pump (including lubrication).
    - Sludge transfer pump seal water line.
- 6 month North Plant scum collector cleaning and lubrication.
- Annual inspection:
    - South primary collector drives.
    - North primary bridges.
    - Sludge transfer pumps (and valve exercise).
    - Scum transfer pumps.
- Annual bar screen and compactor lubrication and parts replacement.
- 2 year bar screen conveyor gearbox check and oil replacement on SC-0152.
- 2 year scum and sludge long and cross collector gearbox lubrication check.
- Chain repair on CM-0302, primary tank 3.
- Replace deck plates on scum pump valve actuator for P-0130, P-0530, P-0730.

APPENDIX G – Maintenance Activities

- Hoist limit switches adjusted on North Plant primary bridges.
- Desiccant breather replacement.
- Teeth replacement on rake for bar screen SC-0142.
- Replacement of flushing water valve actuator on bar screen SC-0152.
- Replace broken sprocket cover/cap on CM-0101, primary tank 1.
- Replace wiper teeth and leather on SC-0132, bar screen 4.
- Replaced secondary rotary limit switches on CM-0902, primary tank 9.

Support Services (Work Area 3)

Work Area 3 includes support services around the plant, process air blowers, and the electrical system. A total of 4248 work orders were closed in this work area in 2018. The following maintenance on major structures, equipment, apparatus, mechanism or thing forming the Works was completed by Work Area 2 in 2018:

- Weekly Emergency generator inspection.
- Biweekly boiler water testing.
- Monthly:
    - Test and verify emergency generator on load.
    - Blower inspection.
- 3 month:
    - Functional inspection of the phosphorus removal system pumps.
    - Waste gas burner inspections.
- 6 month :
    - Check of dechlorination pump VFD cabinet fan.
    - Verification of blower axial trip alarm operation.
    - Electrical generator inspection, testing and maintenance.
    - WAS pump inspection and motor bearing lubrication.
    - Testing of the blower motor bearings and auxiliary oil pump.
- Annual:
    - Calibration and functional check of sludge recirculation pumps and instruments.
    - Electrical and instrumentation checks of centrifuges.
    - Centrifuge feed pump motor maintenance and functional resting of discharge and suction pressure switch.
    - Check of sodium bisulphite piping heat trace and calibration of the temperature transmitter.
    - Primary collector shutdown torque switch functional test.
    - Digester dome and tank instrument checks.
    - Centrate pump motor maintenance and testing of pressure switches.
    - Primary tank collector torque monitor calibration.
    - TWAS Pump motor maintenance and instrument calibration.

  - Sodium Bisulphite ultra-sonic level transmitter verification.
  - Megger testing of WAS and RAS pump motor and VFD inspection.
  - Functional testing of bar screen conveyer emergency trip circuit and rake drive motor emergency shutdown circuit.
  - Blower soft start controller checks.
  - Generator control panel and instrumentation inspection.
  - Generator noise enclosure inspection.
  - Lubrication of diesel generator.
- 2 year 4.16 kV MCC checks.
- 2000 hour Centrifuge RTD functional checks and motor lubrication.
- Replaced lubrication oil cooler on blower BL-1311.
- Overhauled discharge valve on blower BL-1401.
- Replaced level sensors on Digesters 4, 6 ,7, 8, 9 and 10.
- Replaced soft-start control on blowers.
- Replaced VFDs on RAS pumps.
- Repaired motor on MTI pumps.
- Optimization and run process adjustment of the cogeneration system.

Liquid Secondaries (Work Area 4)

Work Area 4 encompasses secondary treatment processes including aeration, phosphorus removal and final clarification. A total of 2256 work orders were closed in this work area in 2018. The following maintenance on major structures, equipment, apparatus, mechanism or thing forming the Works was completed by Work Area 2 in 2018:

- Annual:
  - WAS/RAS pump and pump motor inspection.
  - Inspection of dechlorination spill tanks.
  - Condition check for sodium hypochlorite holding tanks.
  - Efficiency test of sodium hypochlorite dosing pump.
  - Final tank inspection of collector arms and main drives.
- Quarterly
  - Cleaning of sodium hypochlorite dosing pump inlet strainer.
  - Dechlorination sample pump inspection.
- 6 month
  - Scum and sludge collector gearbox oil check and inspection.
  - Scum tank inspection.
- Monthly
  - Sodium Hypochlorite tank inspection (detection holes and stave joints)
- Weekly
  - Inspection of suction and discharge pressure for dechlorination pumps
- Repair of sodium hypochlorite emergency feed line (T-9000).
- Repair of collector arm on final tanks 6 and 13.

APPENDIX G – Maintenance Activities

- Rebuild of scum piping system on final tank 13.
- Rebuild of final tank 18 collector gear box.
- Rebuild of various scum and ferrous dosing pumps.
- Repair of ferrous chloride P-0340 discharge pressure gauge.

APPENDIX H – Staff Training Courses

APPENDIX H– Staff Training Courses

Training attended by Humber Treatment Plant operations and skilled trades staff in 2018 includes the list of courses below.

Technical and Health and Safety Training:

- Activated Sludge
- Aeration Tank 5 Gate Training
- Aeration Tank 5 Grid and Mixer
- Aeration Tank 5 Training
- Aeration Tank 5 Valve Training
- Air purifying Respirators (2017)
- Air Quality and Your Health (May 2018 Tailgate)
- Arc Flash for Non-Qualified Persons (2017)
- Asbestos Awareness
- Backflow Prevention Awareness (2016-2018)
- Basic Vibration Analysis
- Behavior and effects of Air in Water Distribution Systems
- Centrifugal and Positive Displacement Pump Operation
- Conductors (2016-2018)
- Confined Space Awareness
- Confined Space Awareness 1/2 day (2016-2018)
- Confined Space Rescue - 2 day
- Critical Pump Maintenance, Packing and Mechanical Seals
- Cross Connection Specialist Backflow Tester - Certification
- Designated Substances Awareness
- Disinfection of Potable Water Piping (2016)
- Electrical Safety for District Operations & Maintenance Operators (2016-2018)
- Electrical Safety for Maintenance Staff (2016-2018)
- Emergency First Aid Level 'A' CPR (2016-2018)
- Fall Protection Awareness
- Fire Hydrant Replacement (On-The-Job)
- Fundamentals of Ladder Safety Awareness
- Health and Safety Competency for Front-line Supervisors
- Hot Work Permit System Awareness (2016-2018)
- Incident reporting (2017)
- In-Service Health & Safety Orientation
- JHSC Recognition Event
- Joint Health and Safety Committees - (JHSC) Certification Training Part I - Basic
- Joint Health and Safety Committees - (JHSC) Certification Training Part II - Workplace Specific Hazard Training

APPENDIX H– Staff Training Courses

- Lock Out, Tag Out & Test Awareness (2016-2018)
- Lockout, Tag Out and Test Awareness
- Logbook Entry (2017-2019)
- Mathematics for Operators: Module 2 (2016-2018)
- Mathematics for Operators: Module 3 (2017-2019)
- MMR - Self Contained Breathing Apparatus (2018-2020)
- Mould Awareness
- North Primary Bridges Training for HVAC and Maintenance Mode
- On the job: Humber WWTP Co-Gen System Operation
- On the job: Humber WWTP Digestion Process Major Components
- On the job: Humber WWTP Distribution and Grit Removal Process
- On the job: Humber WWTP Sludge Thickening Process Overview
- On the job: Humber WWTP Solids Work Area Overview
- Plant Technician Training - Day 6
- Preliminary and Primary Aeration Diffuser Training
- Preventing Back Injuries (August 2018 Tailgate)
- Rigging Safety Awareness (2016-2018)
- Safety Data Sheet Interpretation for WHMIS 2015
- Safety in a High Voltage Environment (2016-2018)
- Safety on the Road (November 2018 Tailgate)
- Scaffolding Awareness Course (2016-2018)
- Secondary Upgrades Instrument Training
- Standard First Aid - Level "C" CPR & AED - 2 Day (2016-2018)
- SW ST Slips, Trips and Falls Prevention
- SW ST Tipping Floor Traffic Management
- Tailgate - Personal Protective Equipment Training
- Tailgate-Ladders, Safety Procedure SP25
- Tailgate-Lifting Safely: Posture Matters
- Toronto Water Orientation
- Traffic Control Roadway Work (2016-2018)
- Transport of Dangerous Goods (2016-2018)
- Trenching and Excavation Awareness (2016-2018)
- Water Leak Detection Listening Course
- Water Valve Training, Selection, Operation, Maintenance
- West Substation RPU
- West Substation Upgrades- Humber TP
- Winterwise: The Cold Hard Facts About Distribution Systems
- WMS Avantis Workshop
- WWT - MOECC Exam Prep for Wastewater Treatment Level 3 and 4

APPENDIX H– Staff Training Courses

Other Training:

- 2018 Equity Symposium - #Times Up - Working Together to end workplace sexual harassment
- Building Customer-Centric Culture from the Inside Out
- Building Resilience While Facing Adversity in Work and Life
- Customer Service Excellence for the Internal Customer
- Human Rights in the Workplace
- Leadership Skills for Non-Managers
- Lean White Belt Training
- Long Range Financial Planning
- Outlook 2013: All About Outlook 2013
- Performance Management in a Unionized Environment
- PFR - PK - Returning Employee Overview 2018 (REO)
- Psychological and Mental Health in Our Workplace (Tailgate February 2018)
- Respect in Our Workplace
- Role of the Employee During Change
- TPS New Employee Orientation Day (NEO)
- Transition to Manager II: Implementing Your Plan
- Understanding Your Leadership Capacity & How Emotions Play a Part
- Wellness and Resiliency